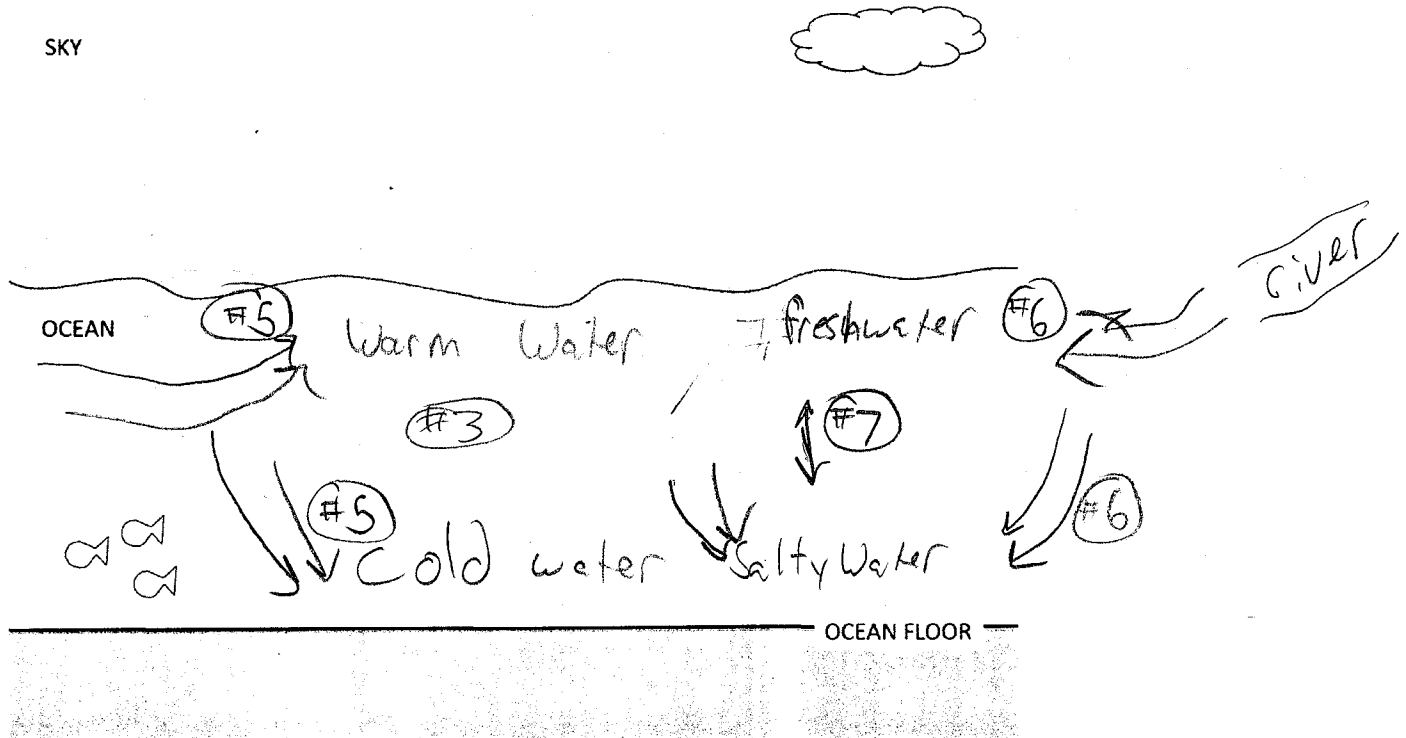


Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.

SKY



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

When the temp. is more dense, with saltwater the warm, dense saltwater will sink, as the cool, less dense freshwater rises.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: Continuous movement of something

Hadley Cell: Circulation flow that varies with different levels of direct sunlight.

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

The transfer of water between reservoirs circulates, along with certain processes of potential/kinetic energy.

C. What causes the differences in density in the atmosphere?

Warm, less dense air rises in the sky while cooler, more dense air sinks.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

As the sun shines on certain area the warm air will rise and the colder air that could be shaded falls where warm air was and constantly circulates.

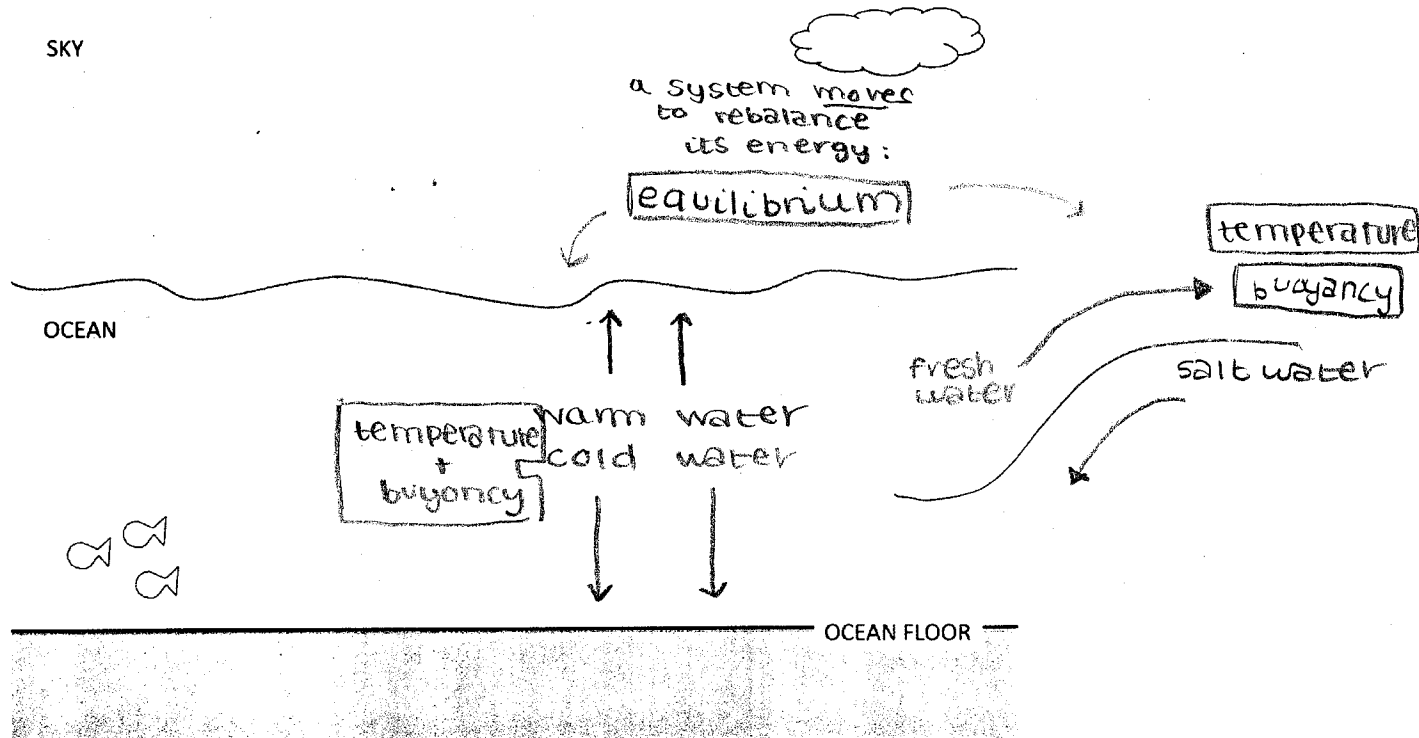
There is no circulation in oceans, as freshwater enters a salty reservoir, salt water sinks fresh water rises.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Everything would be thrown off, if solid water were more dense it would sink and would change the flow of fresh and saltwater.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

Both temperature & composition of water effect the circulation of water in the ocean. Salt water is more dense because of the added NaCl molecules. Therefore when it converges w/ less dense freshwater, the saltwater will

sink below the freshwater and the freshwater will rise to the surface. The higher temperature will be towards the surface because the water is less dense (molecules moving faster/further apart/less molecules in a given volume)

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:
Circulation:

Hadley Cell:

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

C. What causes the differences in density in the atmosphere?

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

B

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation:

Hadley Cell: It is a circulation pattern that involves air rising near the equator due to a more direct sunlight
MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy? *The last two weeks we covered the movement of water between 2 locations and how energy (gravitational, chemical, thermal) are involved in these processes. The concept of circulation is related because it involves of matter (water/air) is continually moving in order to reach a point of equilibrium. Energy is involved in the circulation process as well.*

C. What causes the differences in density in the atmosphere?

Temperature differences cause differing densities due to the movement of molecules. When temps increase, molecules move faster and spread farther apart causing less molecules to exist in a given volume. This means at higher temps the air will have less density (rise) and at lower temps will have greater density (sink)

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

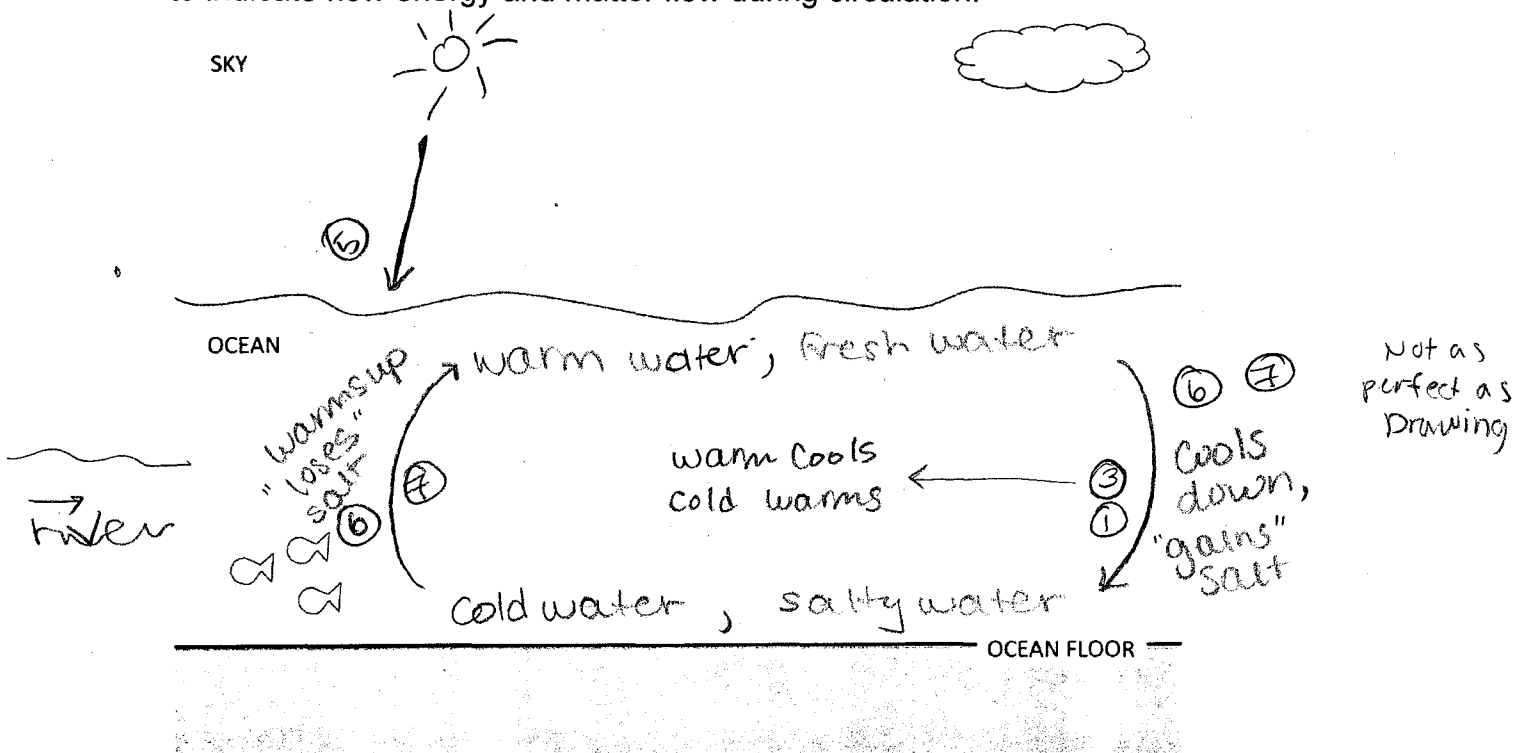
When warm air in the atmosphere cools off, it eventually sinks. Cool air spreads across the earth's surface and eventually gets hit by sunlight & rises.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

~~SECRET~~
~~SECRET~~
~~SECRET~~

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

We used the given numbers to indicate which causal principles are shown.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

As salty or cold water is added to a body of water, it falls to the bottom as a result of buoyancy because it is less dense than the fresher and/or warmer water that rises above. As the top water gets closer to equilibrium (through cooling and mixing with salt), it falls back down because it is more dense.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation:

Hadley Cell:

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

As reservoirs change as a result of energy transfers, circulation results because of the causal principles! ☺

C. What causes the differences in density in the atmosphere?

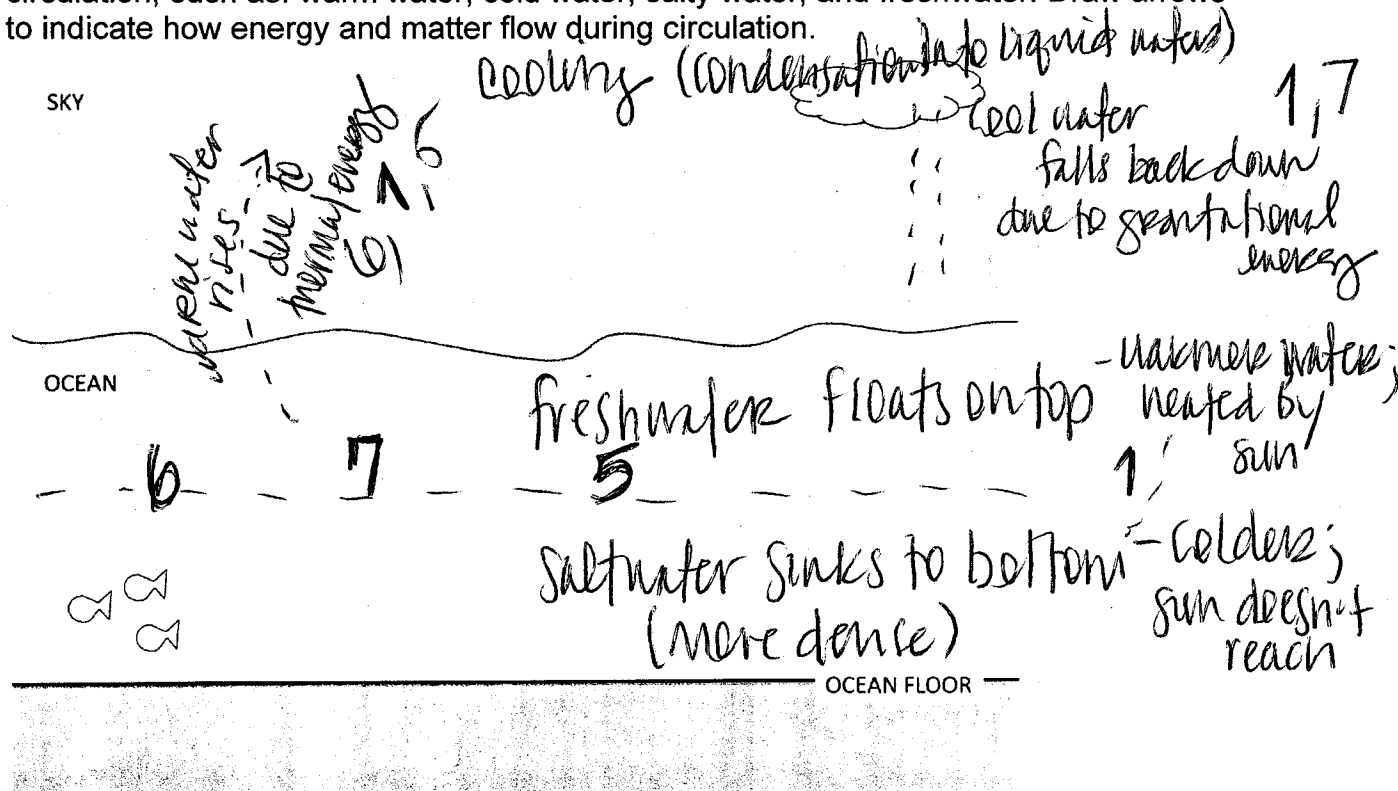
Temperature, composition, pressure

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

Circulation of water in the ocean due to temperature and density changes. The more dense & salty molecules will sink and warmer molecules will float. Gravitational and thermal energy drive these changes, depending on molecule movement and warming or cooling.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: movement of material due to differences in the molecules.

Hadley Cell:

process of air heating and rising and cooling and sinking

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Energy drives the changes of water between the reservoirs.

C. What causes the differences in density in the atmosphere?

the warmer the atmosphere the more molecules in the air, the greater the density

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

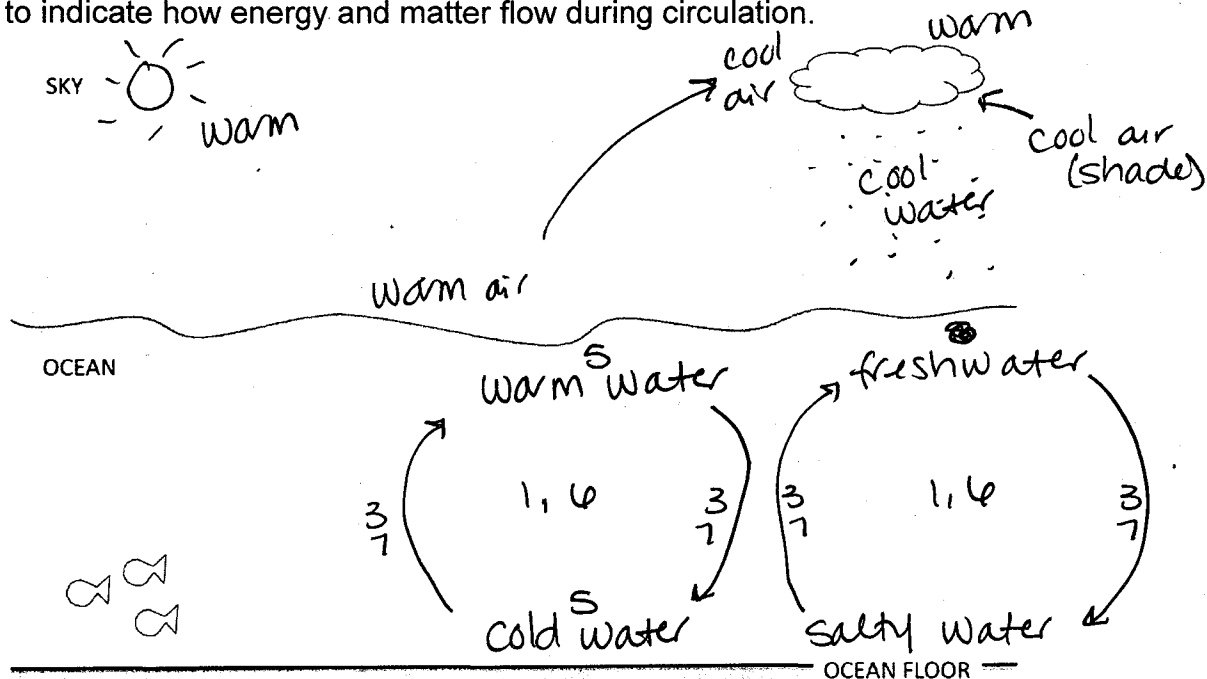
Cooler air falls and warmer air rises. the cooler air which ~~down~~ condenses falls, and recreates the cycle.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

The solid water would sink making it more difficult to be heated by the sun, stopping the flow of circulation.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

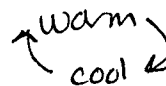
Circulation is affected by changes in density due to changes in temp., composition, + pressure. Salt water is always more dense than freshwater and cold water is always more dense than warm water.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: Movement because of changes/differences in the substance

Hadley Cell: Warm air rises + falls when it cools



The diagram shows a curved arrow pointing upwards labeled 'warm' and a curved arrow pointing downwards labeled 'cool', representing the convection cycle in a Hadley cell.

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

As water/energy/density changes each entity changes in order to stay in equilibrium.

Circulation shows gravitational energy due to density changes.

Thermal energy changes create the density changes.

Chemical energy changes composition, changing density.

C. What causes the differences in density in the atmosphere?

→ ...and pressure, temperature + composition changes.
Increased density causes the air in the atmosphere to sink.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

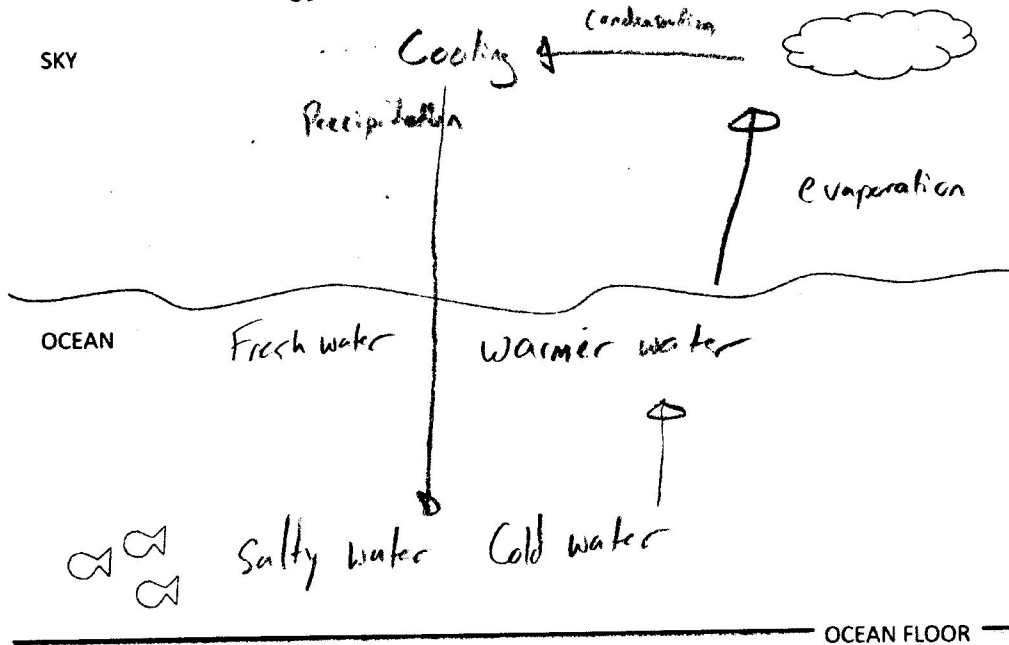
Atmospheric circulation is warm air rising + cool air taking its place continually. Circulation is caused by changes in density. Energy in oceans that drives circulation is gravitational, thermal + chemical.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

If ice cubes sank, then they wouldn't have the opportunity to circulate and move until they warmed up.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: ~~warm water~~, ~~cold water~~, ~~salty water~~, and ~~fresh water~~. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

- | | |
|--------------------------------|------------------------|
| 1) precipitation, condensation | 7) warm and cold water |
| 3) whole system | 6) warm & cold water |
| 5) system | |

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

The sun heats the atmosphere at the equator and the warm air/moisture travels away from the equator, cools, and rains. The cooler water travels back to the equator to heat up and evaporate once again.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: movement of molecules in a circular pattern

Hadley Cell:

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

determines the flux

C. What causes the differences in density in the atmosphere?

The heat and rays coming from the sun.
Water vapor & pressure

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

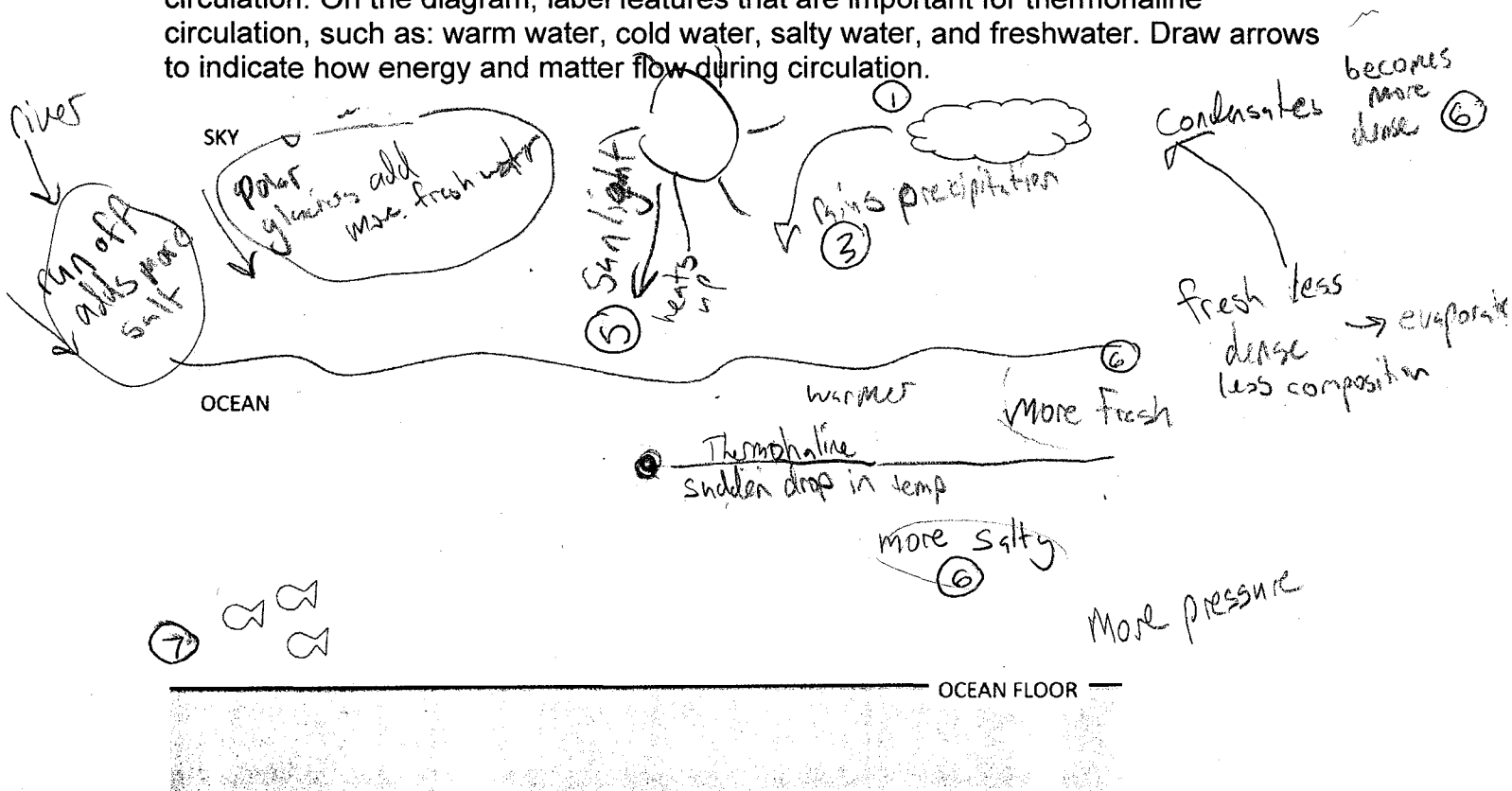
The sun heats the air and the air travels away from the equator. It rains and freshwater runoff into ocean. The freshwater raises as saltwater sinks. The water on top of the ocean is heated and evaporates.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

The polar caps would be under water instead of top.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

Thermohaline circulation is the heat circulation within the ocean.

The thermohaline is affected by salinity, temperature and pressure which determines the density of the thermohaline line. Whatever is below the thermohaline line is more dense because of the sudden change of colder temperature.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation:

Hadley Cell:

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

C. What causes the differences in density in the atmosphere?

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

The solids would lie adjacent to the thermohaline line.

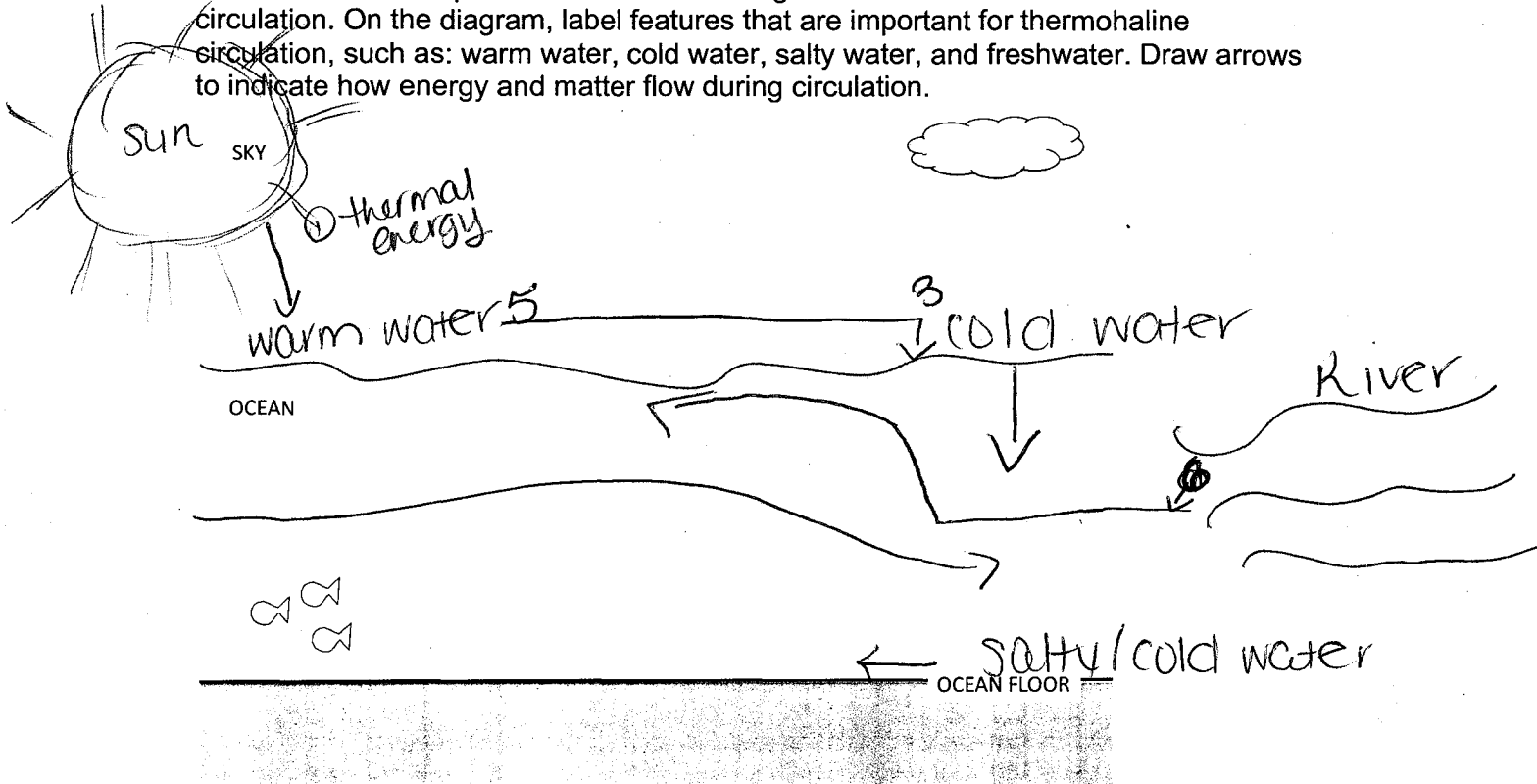
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Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

Principle: equilibrium applies to everything if there is movement.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

We know that cold water is more dense and sinks, while warm H_2O rises, or is less dense. Salt water is denser than fresh H_2O .

When you have a change in one variable due to external causes, it drives change in the whole cycle.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Objectives

Upon completion of this activity, you will be able to:

- Describe how energy drives movement and change in the hydrosphere and atmosphere. You should also be able to predict circulation in the atmosphere and hydrosphere may change due to global warming.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.
3. Matter moves and changes to return a system to **equilibrium**.
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.
6. When molecules move faster, the **density** of most substances decreases. Water is an anomaly because liquid water is more dense than ice.
7. **Buoyancy** causes materials to rise or fall due to the relative density of materials.

PART 1: Background Notes and In-Class Work

Use this space to describe a) how temperature affects the density of air and water and b) how salinity affects the density of water, and c) principle relationships between atmospheric circulation and circulation in a lava lamp.

Comparing Lava Lamp and Atmosphere Circulation

Lava Lamp	Atmosphere	Principle
Hot and cold regions	Hot and cold regions	temperature density
Heat from light bulb	Heat from the ground	temperature
Two fluids	Hot and cold air	buoyancy
Spherical and cylindrical masses of circulating fluid	Hadley cells	equilibrium

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation:

Hadley Cell:

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Energy drives circulation
& changes reservoirs

C. What causes the differences in density in the atmosphere?

Warm & cold air, the sun,
geographic location, things that
cause shade.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Part 3: Homework

If you complete the group work, you may work on the homework on your own. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

True or False:

1. Ocean circulation transfers heat to the polar regions of Earth.

TRUE

FALSE

(circle one)

Explain your reasoning for this answer:

Temperature of water has the ability to change the temp. of area

2. During ocean circulation, warm water rises in the equatorial regions of Earth. around it

TRUE

FALSE

(circle one)

Explain your reasoning for this answer:

Short Answer

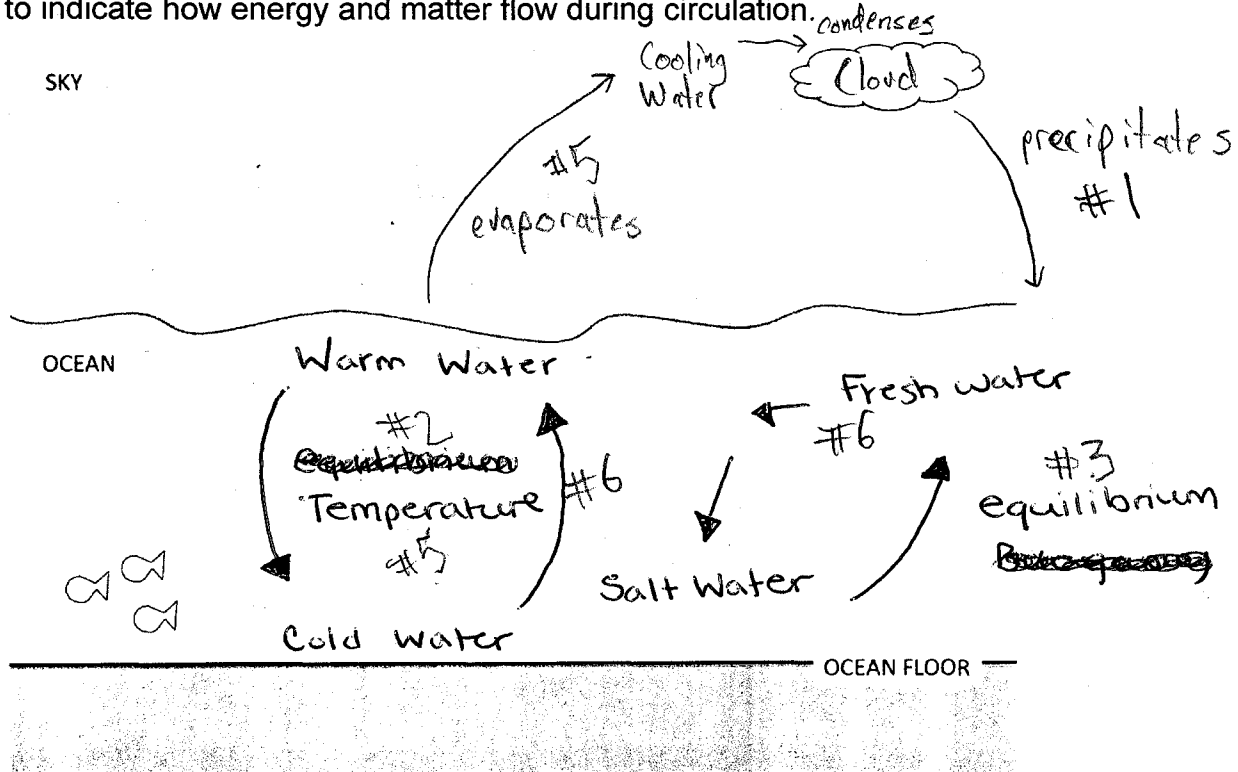
3. What factors can cause the circulation of air and/or water?

temperature, pressure + composition.

4. How might global warming impact the circulation of fluids? You may come up with multiple correct responses to this question.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

Freshwater and saltwater converge, the saltwater sinks because it is more dense, cold water sinks and the warm water stays at the top because heat rises. The water evaporates, ~~and~~ condenses, and precipitates and the cycle starts again.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: Movement of matter

Hadley Cell: ~~Warm air rises at the equator and the sun~~

The sun hits at the equator and the warm air rises

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Circulation is the movement of matter. Since there is a conservation of energy, when matter or water moves from one area or reservoir, it is replaced, continuing the circulation

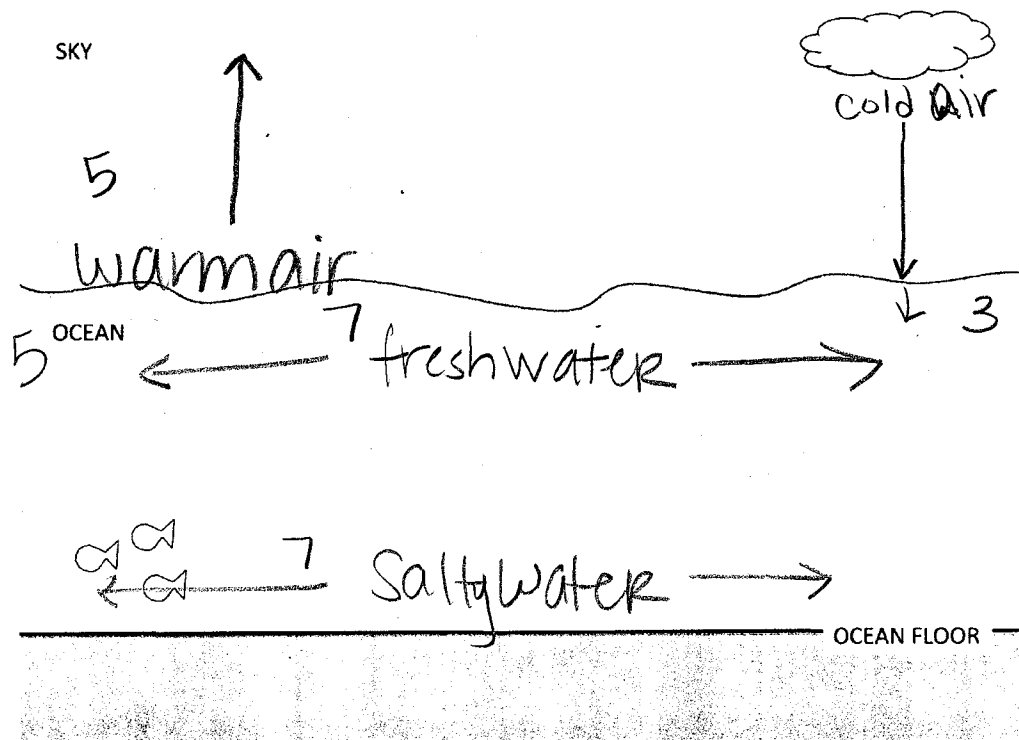
C. What causes the differences in density in the atmosphere?

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

The circulation takes the heat from the equatorial region and delivers it to the polar regions. causing air to rise, cool off, & the sink.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: movement of air caused by shape of the earth & direction of the sun.
Hadley Cell: pocket in the center of the air circulation

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

It relates to the energy molecules and the air molecules in the reservoirs by changing of temperatures and structures.

C. What causes the differences in density in the atmosphere?

The heat from the sun changes the density of the air in the atmosphere

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

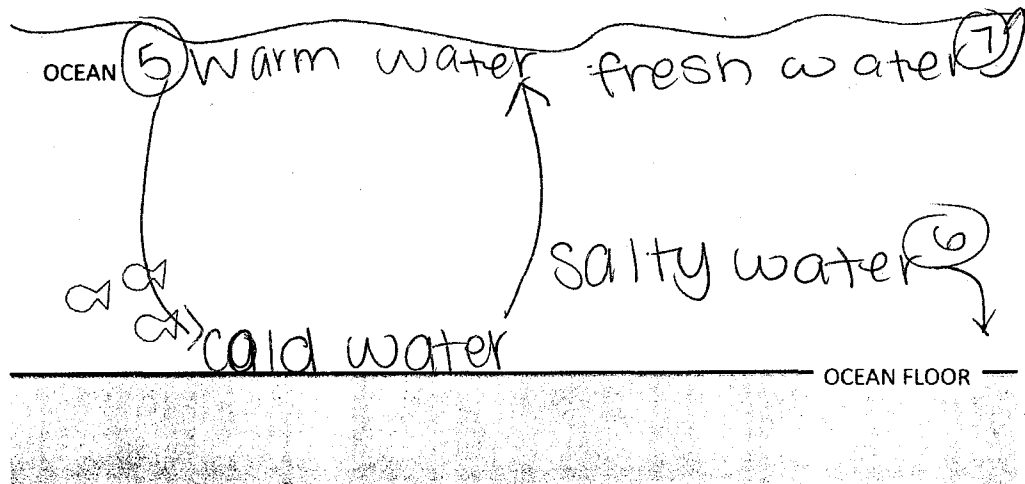
When the sun hits the equatorial region, it heats it up. The warm air then mixes with the cold air causing rising, and sinking which is circulation. In the ocean when fresh & salt water meet, the salt water is more dense than the fresh water so fresh stays above salt water & continues to circulate.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.

SKY



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

The temperature fluctuations affects the rise & fall of the salt in the water. as the temperature rises the salt rises & as it gets colder it falls.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: The movement of air or water.

Hadley Cell: Circulation of air at the equator.

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

It is the same general cycle as the water cycle

C. What causes the differences in density in the atmosphere?

Temperature, composition, & pressure.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

The air is warmer at the equator because of the sun ray. Warmer air is less dense than colder air, so colder air is found by the surface.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

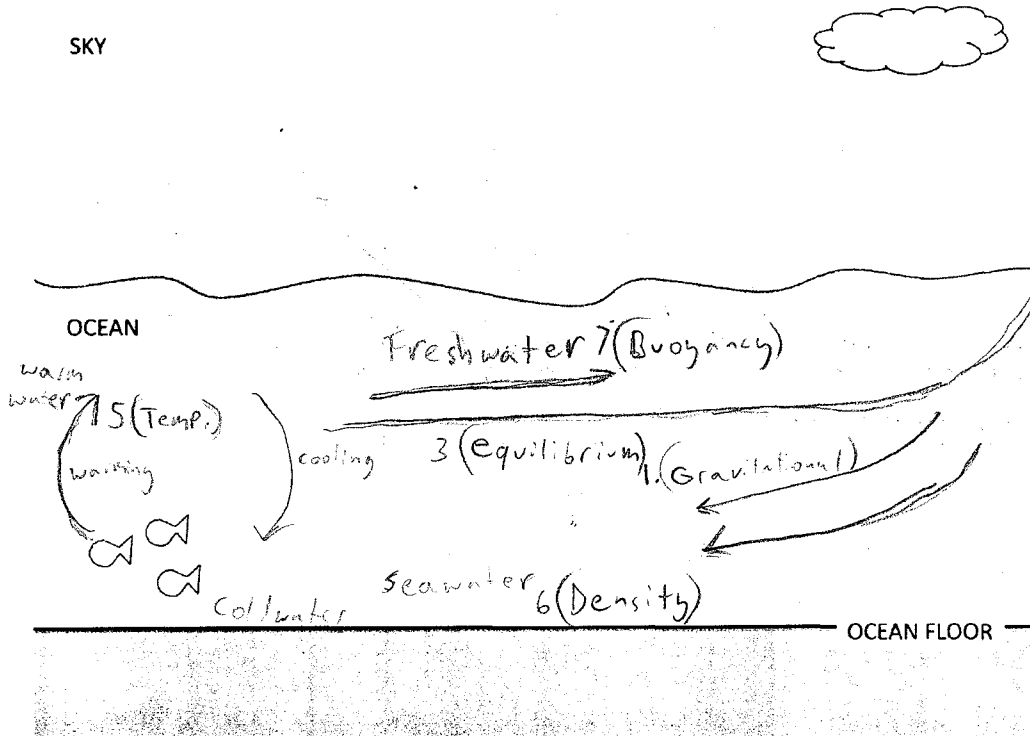
Glaciers are freshwater & float on the top of the water, if solid ice was more dense it would sink to the bottom of the ocean floor throwing off all of the circulation.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.

A43101348 Ben Green

SKY



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

Warmer The warmer ^{fresh} water at the top of the ocean will begin to cool and sink towards the ocean floor. It will then mix with the cooler ^{salt} water at the ocean floor. ~~and then mix with~~

after mixing w/
the saltwater,

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: Movement of materials due to variations and alterations in material.

Hadley Cell: Cycle of rising warm air and sinking cool air.

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

C. What causes the differences in density in the atmosphere?

The differences of density in the atmosphere is caused by the various gases (Helium, CO₂) that the atmosphere is composed of.

Temperature also affects density. Hot air is less dense than cold air.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

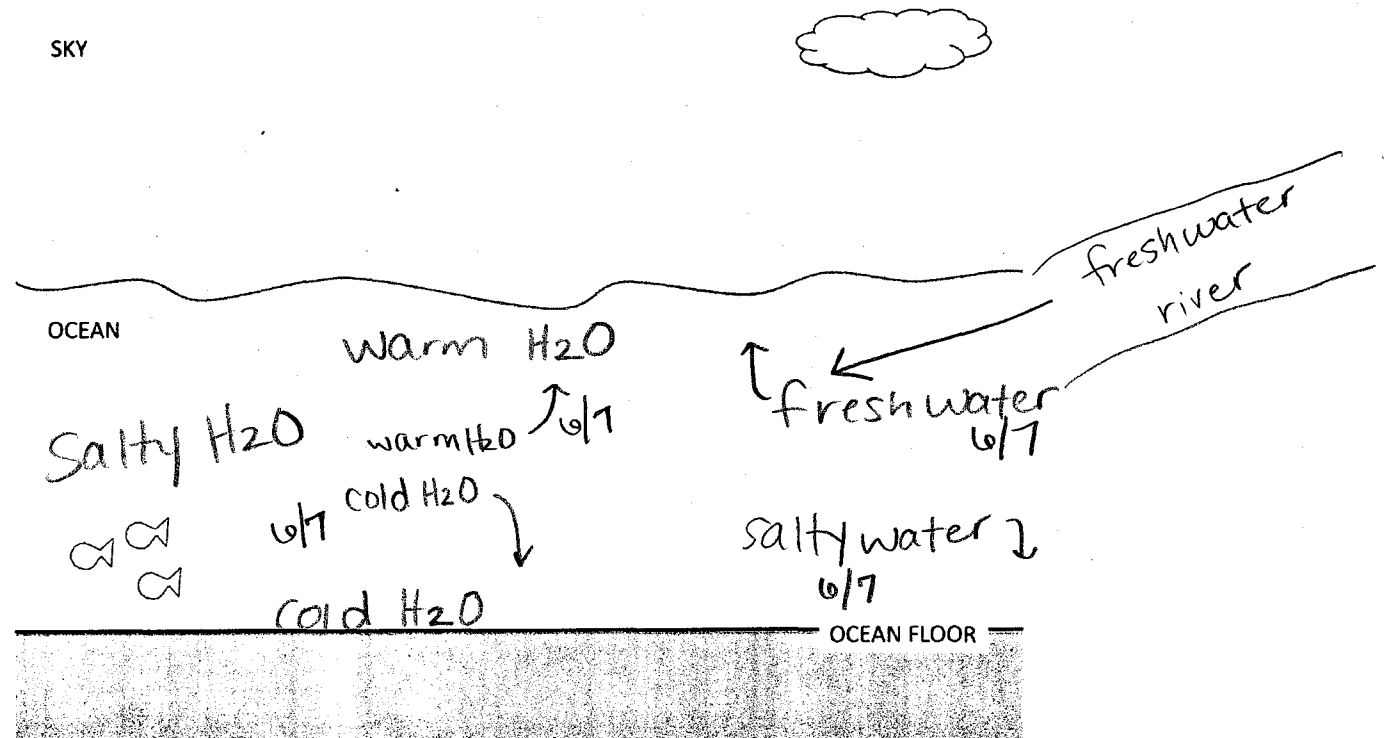


GROUP #:
Student IDs of Members Present:

[REDACTED] A34305310
[REDACTED] A42773599
[REDACTED] A42383975
[REDACTED] A43916317

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

All can be explained by 6/7

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

freshwater enters a saltwater source (ocean), because

freshwater is less dense than salt water it will float on top. During this process, warm water rises above the cool water, because it is less dense. When this warmer water cools, it sinks, creating a circulation.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: warm air rises, cools, then sinks, warms then rises

Hadley Cell: warm H₂O at equator rises and as it travels it loses heat (becomes cooler, and sinks at 30°

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Circulation within and between reservoirs. Energy is transferred as the matter within the reservoirs changes (ex) water heating up from liquid to gas, this change allows this matter to move within and between reservoirs.

C. What causes the differences in density in the atmosphere?

Temperature and pressure

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

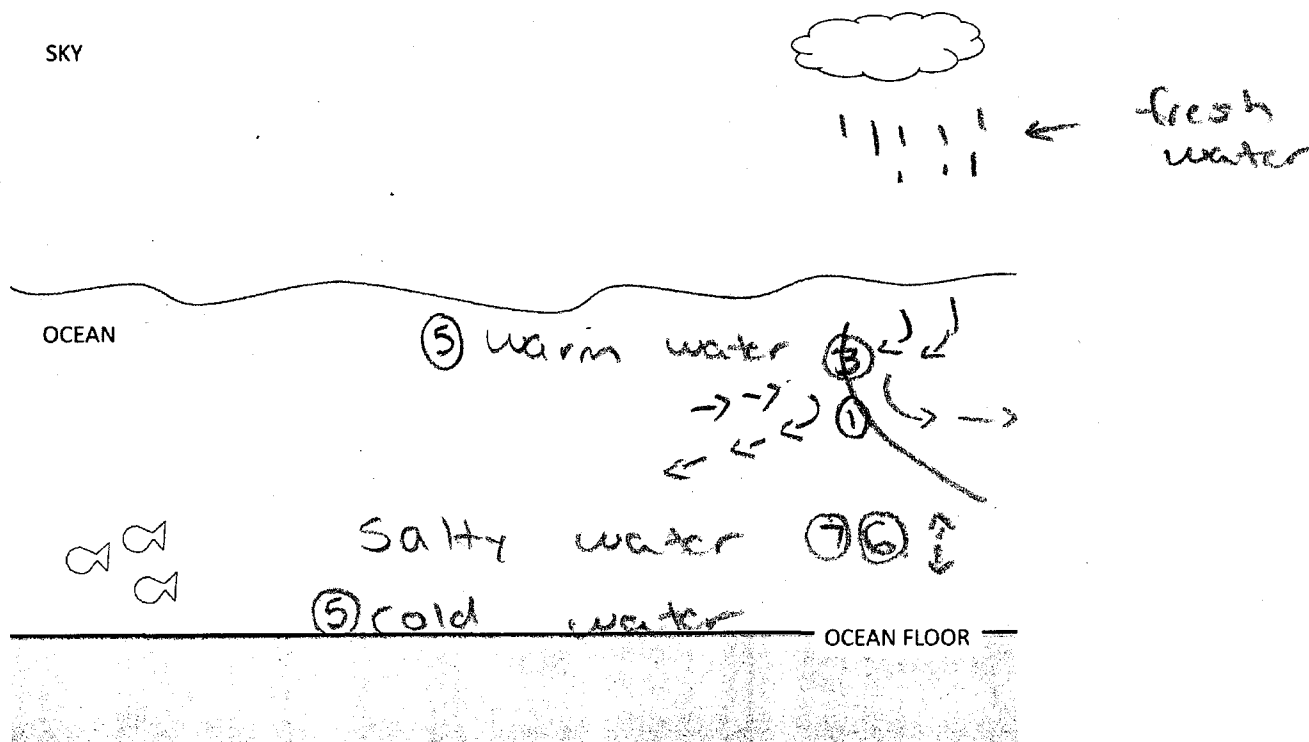
air is warmed and rises ^{from the sun} because it is less dense. When this air is cooled ^{loses heat to surroundings} it sinks because it is more dense than the surrounding air. This air is then warmed ^{by the sun} and the cycle repeats.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Salty water will still be more dense. Colder liquid water would still be more dense than warmer liquid water. Glaciers/icebergs would be at the bottom of the ocean rather than the surface, melting these glaciers would require deep warm water.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

- 1. energy
- 3. equilibrium
- 5. temp
- 7. buoyancy
- 9. density

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

thermohaline circulation of the ocean refers to the flow of ocean water caused by changes in density. This happens when the ocean is warmed or cooled at the surface

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: moving substances around

Hadley Cell: circulation pattern that dominates the tropic atmosphere

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

We've been talking about the water cycle and how it circulates through different reservoirs depending on energy.

C. What causes the differences in density in the atmosphere?

Temperature, composition and pressure change density.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

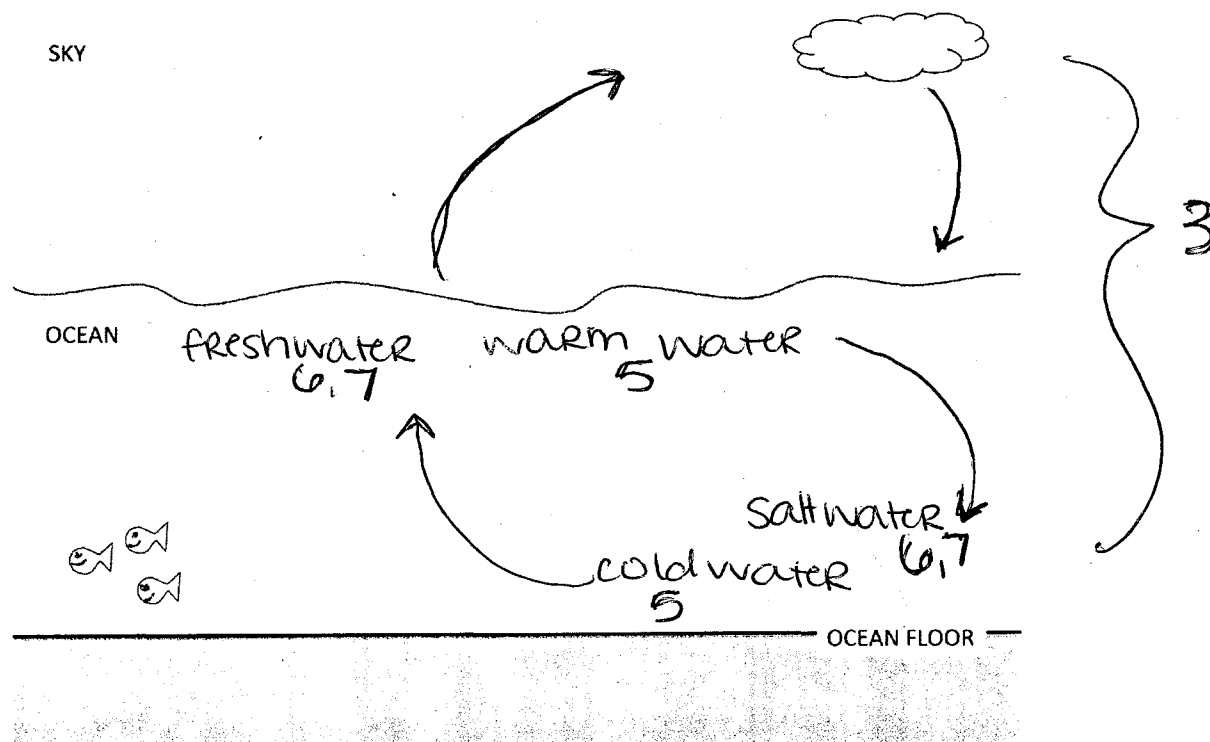
Air is warmer near the equator. The warmer air rises and eventually cools down, that air will then fall, it will rise when it warms up again creating a circulation.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Glaciers are fresh frozen water that floats on the surface. If solid water were more dense then the glaciers would sink to an area which is more salty water. Then as the fresh water melted at the bottom every circulation pattern would be thrown off

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

As ^{fresh} water falls as condensation to the earth, the warmer, fresh water stays on the surface, the water then cools & sinks to the bottom of the ocean, mixing with salt water & becoming more dense, the water at the bottom then warms & rises to the surface where it then evaporates into the atmosphere & then condenses & repeats the process.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: movement of substances within cycles in the environment

Hadley Cell:

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Gravitational & thermal energy is needed to drive the cycles that keep the atmosphere & earth within equilibrium

C. What causes the differences in density in the atmosphere?

~~It~~ Temperatures that cause phase changes cause differences in density.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

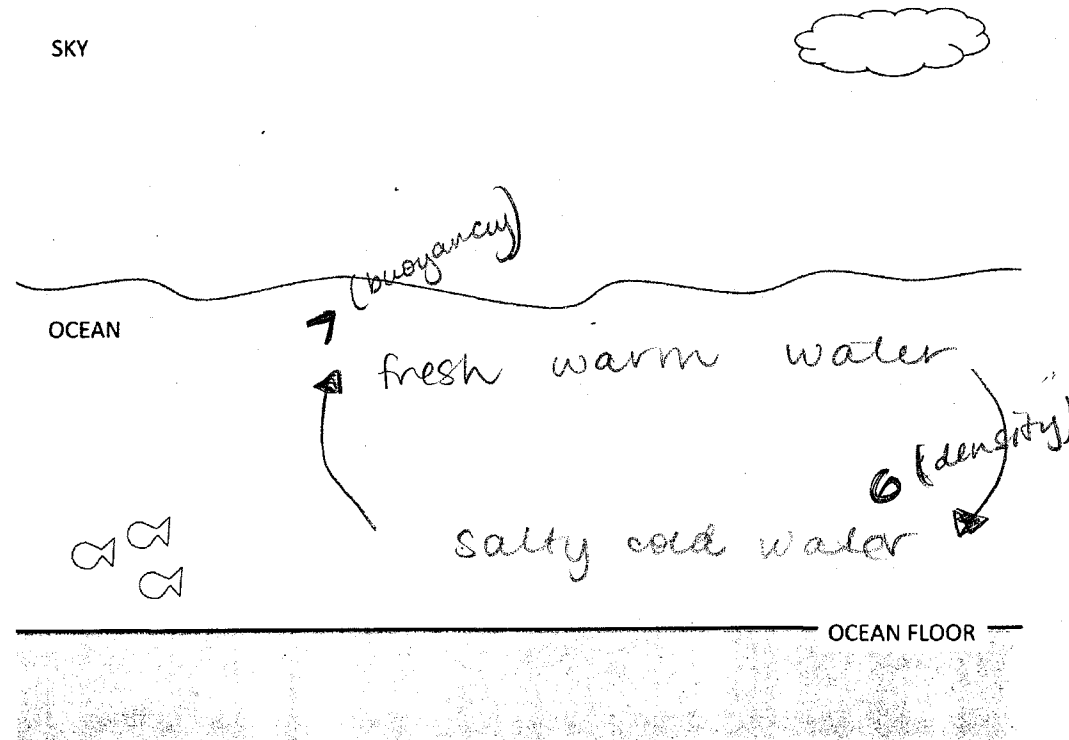
Water evaporates into the atmosphere which ~~uses~~ releases energy when it condenses back into liquid form. Water then falls to earth & freezes OR then evaporates again

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Salt water would be at the top instead of the bottom.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

The salty cold water is on bottom because it's more dense and as the fresh warm water circulates down, the salty cold water and circulates up.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: the movement of materials because of diff.

Hadley Cell: atmospheric diagram of warm air rising and cool air falling

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Water circulates to every point in the water cycle to relate to reservoirs

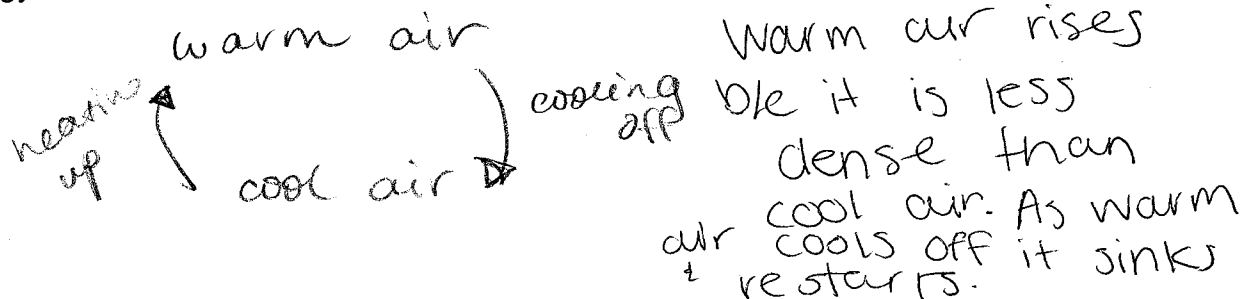
C. What causes the differences in density in the atmosphere?

temperature and pressure

warm air rises
cold air falls

more density
when pressure
increases.

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.



Warm air rises b/c it is less dense than cool air. As warm air cools off it sinks & restarts.

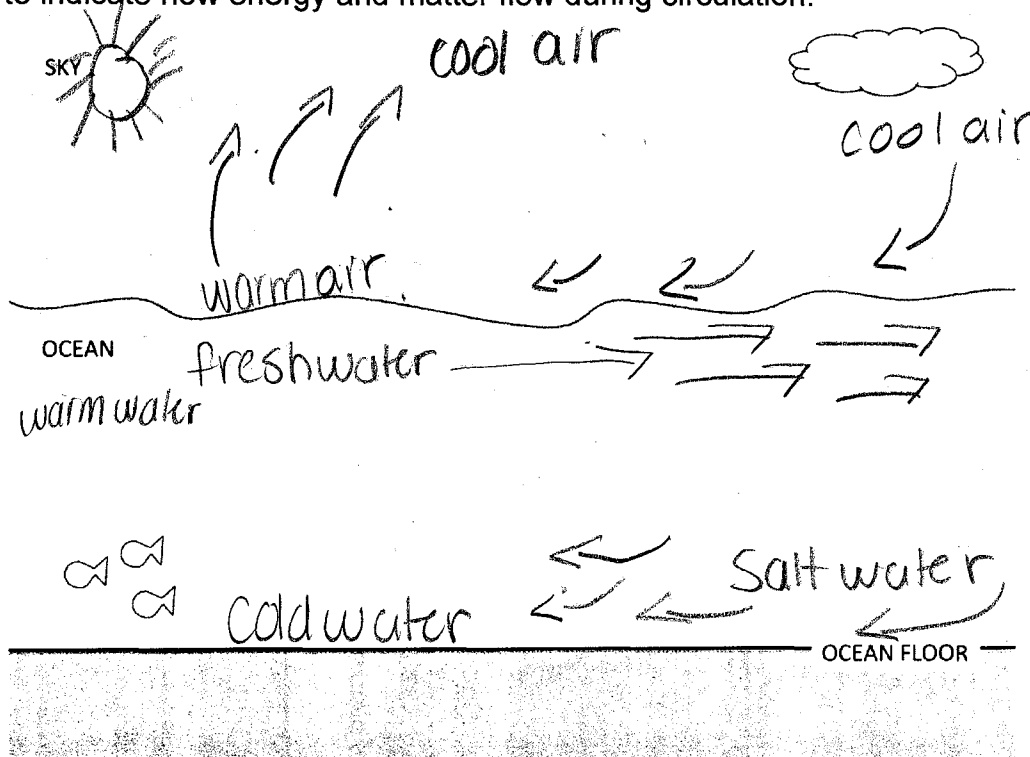
E. How might thermohaline circulation change if solid water were more dense than liquid water?

Ice wouldn't float because it would be more dense than water. Circulation will be completely different, freshwater on very bottom that's cold with cold salt water on top

GROUP #: R
Student IDs of Members Present:
A39979926
A40711436
A40698630
A40994871

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation:

Hadley Cell:

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Pressure, temp, + composition creates different sources of energy and determines how long something will stay in a reservoir for.

C. What causes the differences in density in the atmosphere?

Pressure = changes movement of molecules, add pressure molecules move slower making it more dense
Temp = \uparrow in temp \downarrow density
Composition = changes in the "stuff".

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

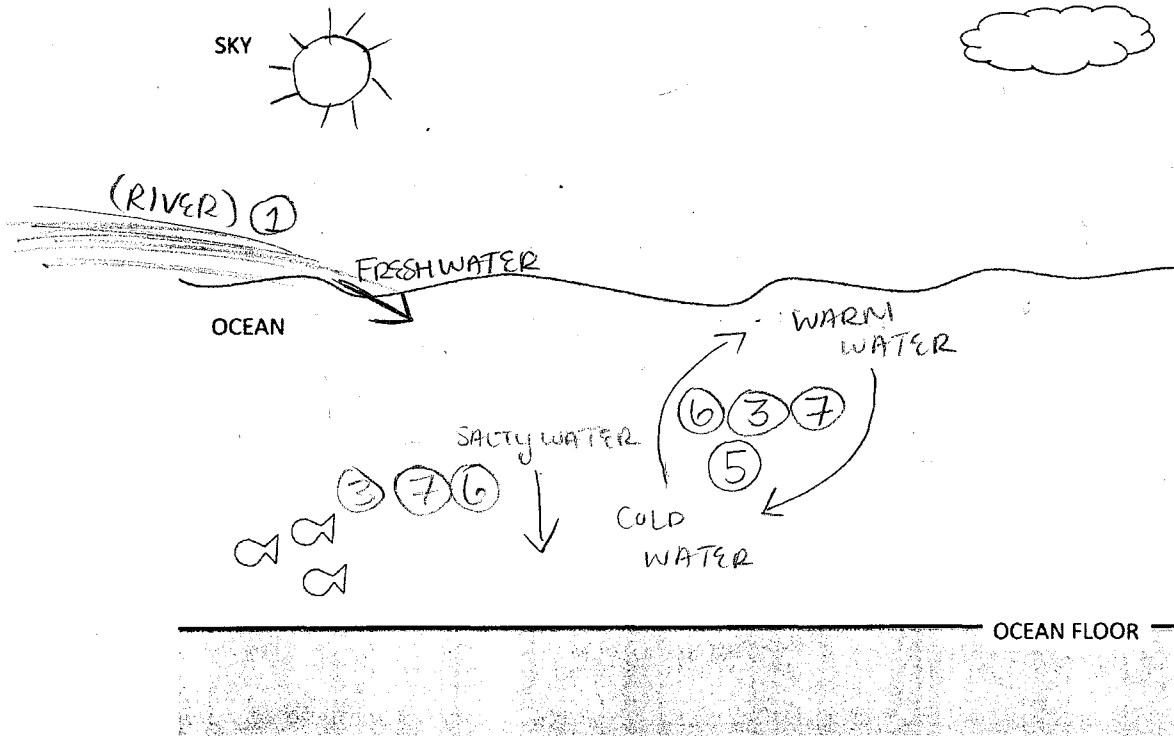
Energy that drives circulation in oceans is thermohaline, which creates circulation due to temp + composition changes.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

The ice would remain buoyant in the liquid water

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

Warm water is less dense than cold water so it stays towards the surface of the ocean. As the sun goes down, the warm water cools and sinks becoming more dense. Then, when the sun comes back up, the water heats up and rises again.

Freshwater flows in from a source such as a river. The freshwater is less dense than the saltwater, so it stays on top while the freshwater floats towards the top.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: the flow of movement by energy, pressure, and temperature.

Hadley Cell: pattern of atmospheric circulation

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

C. What causes the differences in density in the atmosphere?

TEMPERATURE

PRESSURE

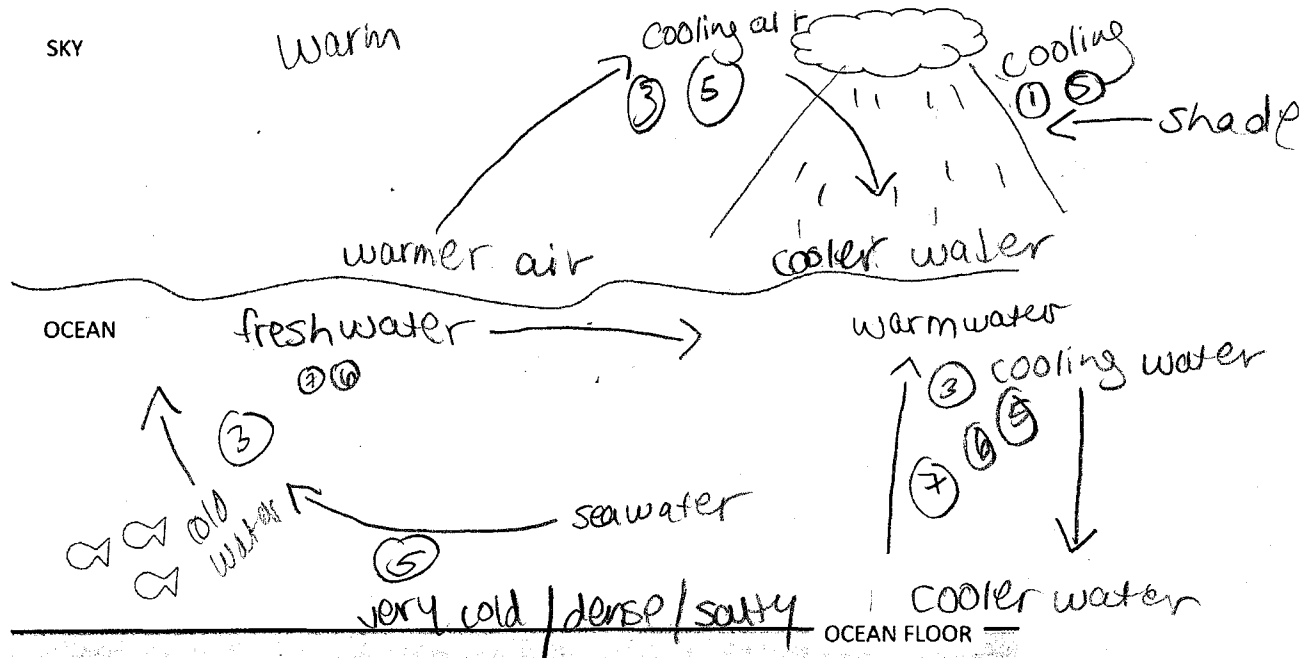
COMPOSITION

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

molecules move towards equilibrium
cold water circulates warms & rises. The freshwater stays near the surface. salt water will sink due to density. warm water cools & sink

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: the movement of molecules affected by density temp. eq.
Hadley Cell: warm air rises & falls when it cools towards equilibrium

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

there is always circulation in the reservoirs
& the circulation is in the air. energy is released

C. What causes the differences in density in the atmosphere?

Pressure, temperature, & composition

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

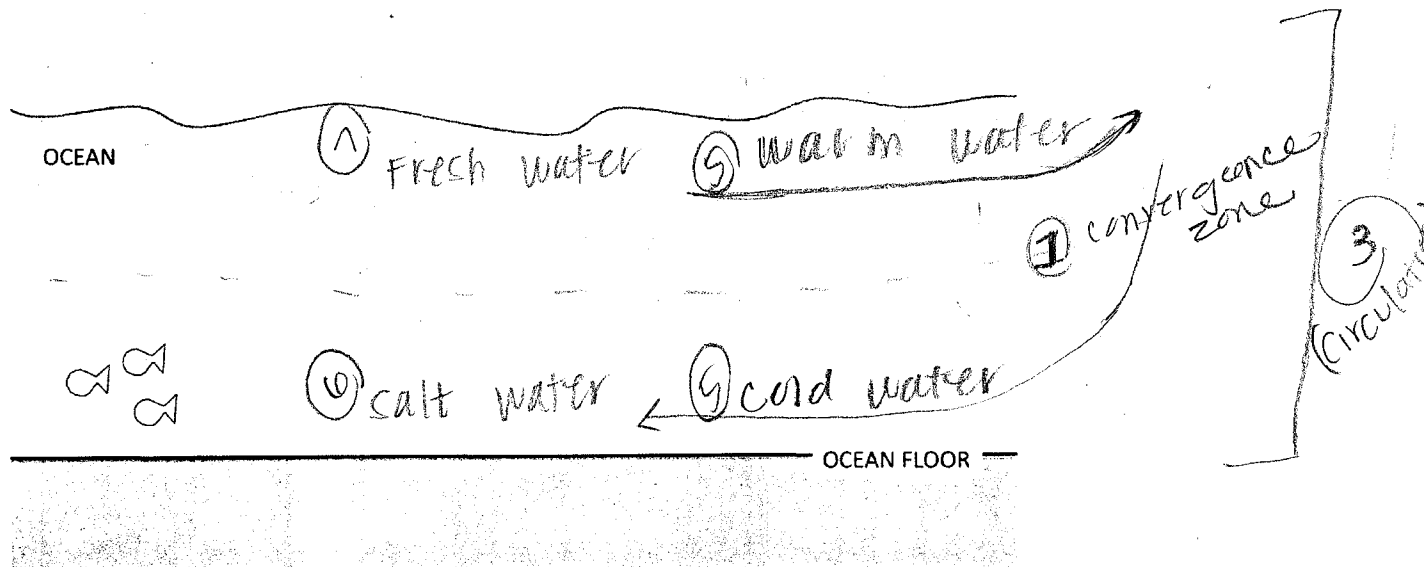
E. How might thermohaline circulation change if solid water were more dense than liquid water?

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~~XXXXXXXXXX~~ A31630993

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.

SKY



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

cold salt water sinks & warm fresh water rises
above the salt water.

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation:

Hadley Cell: the movement of cold & warm air by the equator.

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

Gravitational energy pulls down cold air - like rain, which falls into a lake or ocean, the warm air circulates - rising.

C. What causes the differences in density in the atmosphere?

- pressure*
- composition*
- Temperature*

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

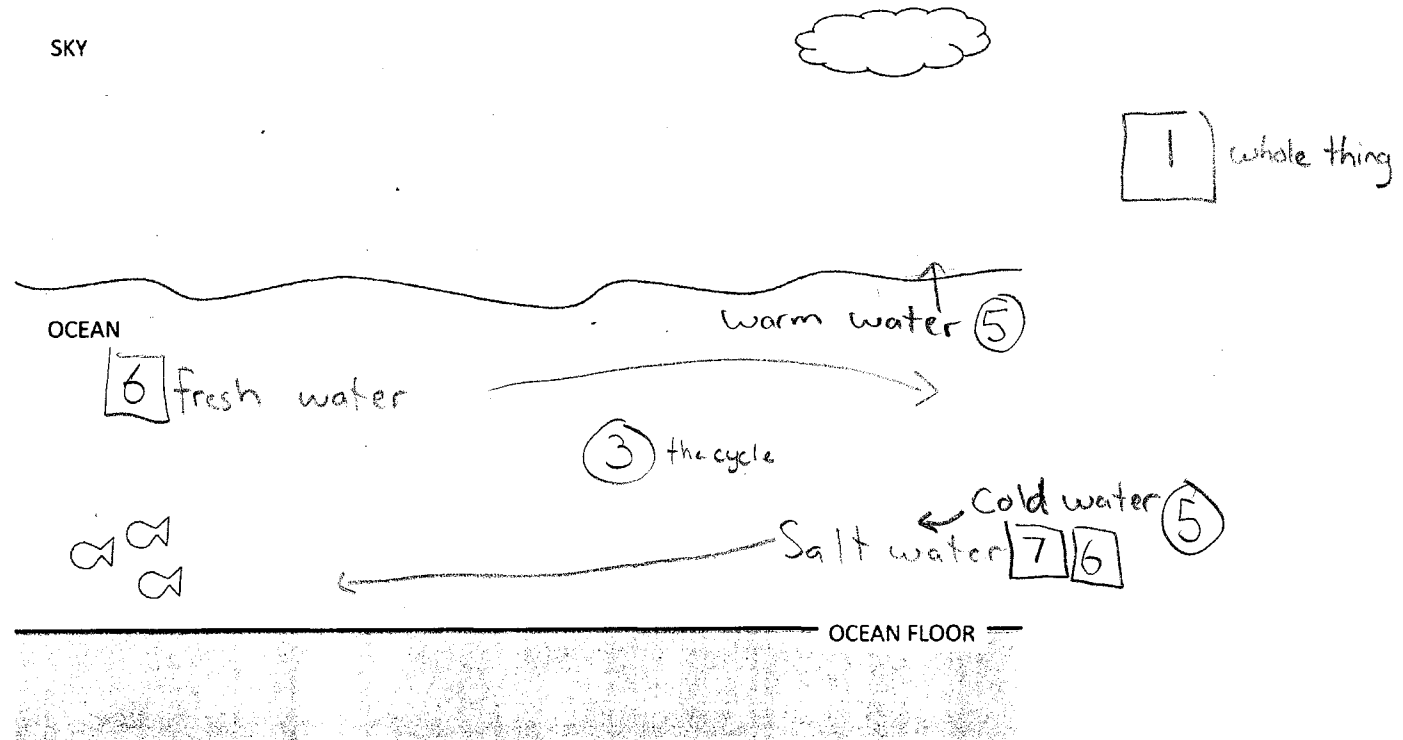
Movement of warm air because of thermal energy which is less dense, and gravitational pull of cold air because it's more dense. cold water also moves down while warm water moves to the surface.

E. How might thermohaline circulation change if solid water were more dense than liquid water?

There would be less circulation because cold water freezes.

Part 2: Group Work

A. Follow the same procedure we used during class to examine thermohaline circulation. On the diagram, label features that are important for thermohaline circulation, such as: warm water, cold water, salty water, and freshwater. Draw arrows to indicate how energy and matter flow during circulation.



B. Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

C. Explain the process of thermohaline circulation in as much detail as possible, and reflecting back on what you already know about reservoirs and energy.

First, salt water is more dense than fresh water, so salt water pushes fresh water up because it sinks. Water on the surface is warmer than water underneath due to the sun. Additionally, when water dumps into the ocean, the water should (could) also be warmer, pushing the colder (salt) water down.

ISP203A – Global Change
Circulation in the Atmosphere and Oceans

Group Questions: USE A SEPARATE SHEET AS NEEDED

A. Step back for a moment. In your group's own words, explain the following terms:

Circulation: The complete process of movement in a system

Hadley Cell: A complete circulation of air.

MAKE SURE EVERYONE UNDERSTANDS THESE TERMS BEFORE MOVING ON!

B. How is the concept of circulation related to the past two weeks' instruction on reservoirs and energy?

All reservoirs and energy follow a circulation pattern to complete their motion

C. What causes the differences in density in the atmosphere?

Heat!

D. Describe atmospheric circulation as completely as possible. Be sure to include an explanation of the causes of circulation in the atmosphere as well as explanation of the energy that drives circulation in oceans.

E. How might thermohaline circulation change if solid water were more dense than liquid water?